COAL MINING

March, 1955 Volume 32, No. 3

UNIVERSITY MICROFILMS
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ANN ARBOR, MICH

With today's increased competition, it is more important than ever to get maximum production at the least possible cost. Your Highway representative will be glad to survey your equipment needs and show in dollars and cents how you can boost output and cut costs . . . stay ahead of competition.

Allis-Chalmers HD-20 with Gar Wood Bulldozer
HARCLIFF COAL CO., East Brady

Lima 1201 RIVER HILL COAL CO., Keeweydin

Allis-Chalmers HD-20 with Gar Wood Bulldozer
H. GROVES & CO., Fairchance

Highway EQUIPMENT COMPANY
6465 Hamilton Ave. • Pittsburgh 6, Pa.

Allis-Chalmers • International Vibro-Tampers • Jaeger
Power-Pack Conveyors • General Motors Diesel Engines
Gar Wood • Erie Bins • Master • Thor • Baker
Michigan Tractor Shovels and Excavator-Cranes
Lima Shovels, Cranes, Draglines

Bottom-Dump Coal Haulers have capacities of 25, 32 and 40 tons . . . engines from 190 to 300 h.p. . . . dual or large single drive and trailer tires . . . torque converter and Torqmatic drive or standard transmission.

EUCLID DIVISION
GENERAL MOTORS CORPORATION
Cleveland 17, Ohio

Higher Availability
More Tonnage
Lower Costs

On scores of mining operations all over the world the high job availability of Euclid equipment results in more tons hauled per shift. Because they're engineered and built for the toughest off-the-highway service, "Eucs" stay on the job longer, with less time out for servicing and repairs.

Dependable low cost hauling has made Euclid the preferred equipment for open pit operations in both the bituminous and anthracite fields. If you're interested in cutting your hauling cost for coal, overburden or waste, have your Euclid distributor prepare a production and cost estimate for your operation. There's a good chance he can show you how to haul more tonnage at lower cost.

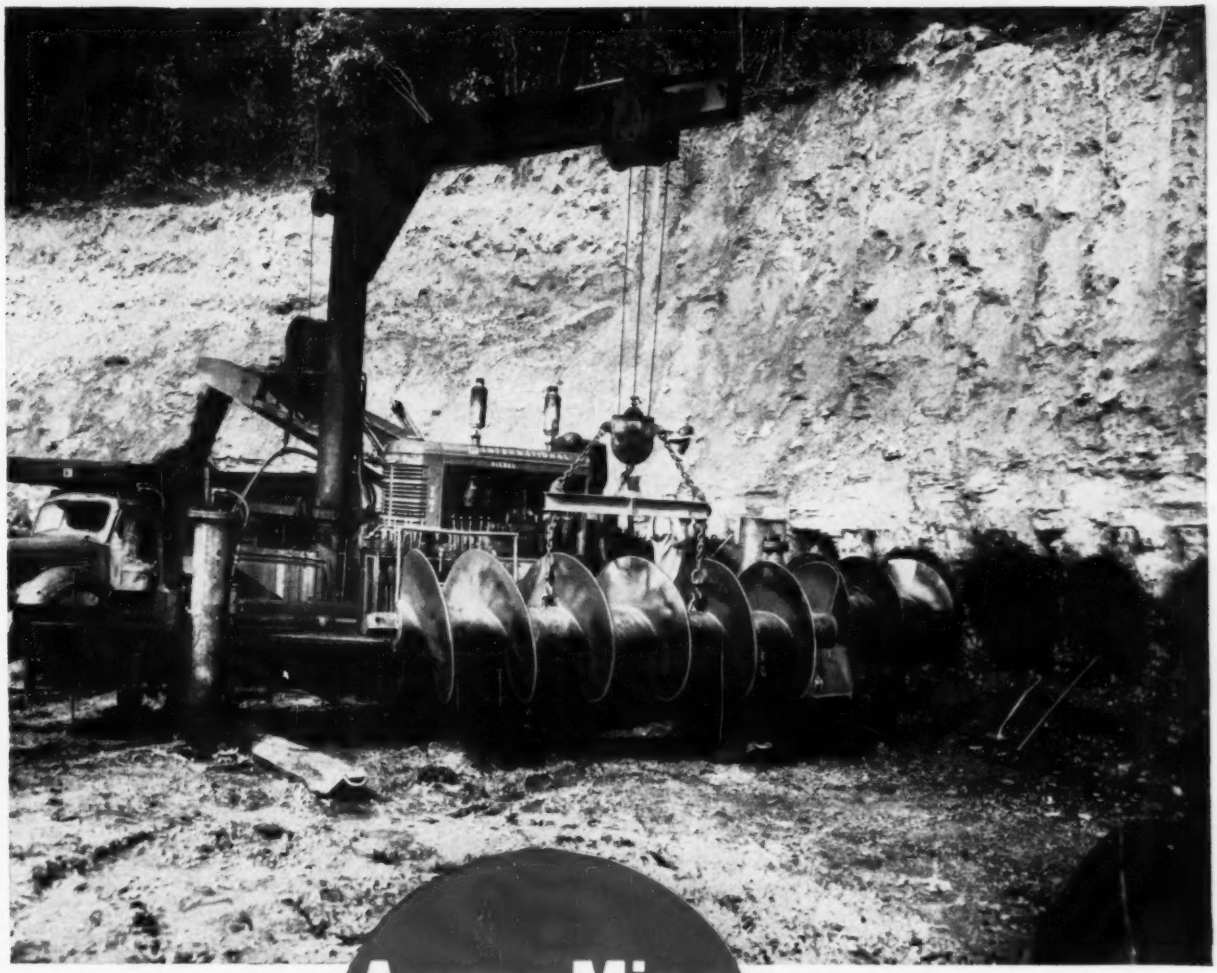
Rear-Dump models are available in 10, 15, 22, 34 and 50 ton capacities with engines of 165 to 600 h.p. . . . semi-rigid or spring mounted drive axles . . . standard transmissions or torque converters and Torqmatic drive.

EUCLID THE PIONEER

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

GM GENERAL MOTORS



McCarthy Coal Recovery Drill, Model 1436-42, with 12' augers as used by Excavators, Inc., Sommerville, W. Va.

Hydraulically operated equipment on McCarthy Drills includes: jacks for levelling auger drill, auger guide, auger hoist, moving jacks and skids, and auger feed.

Auger-Mine BONUS Coal with McCarthy

Heavy Rugged Powerful

COAL RECOVERY DRILLS

- ★ RECOVERS BEST QUALITY COAL AT LOWEST COST
- ★ 40 TONS AN HOUR WITH 36" DIA. AUGER
- ★ COMPLETELY HYDRAULIC
- ★ SELF-PROPELLED FROM HOLE TO HOLE
- ★ CHOICE OF AUGER DIAMETERS 24", 30", 36", 42", 48"

THE SALEM TOOL CO.

S. ELLSWORTH AVE. SALEM, OHIO, U.S.A.

THE SALEM TOOL COMPANY — SALEM — SALEM, OHIO, U.S.A.

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The Facts Behind Allis-Chalmers Leadership in Torque Converter Tractors

***Fourteen* years of experience . . . *eight* years with production models . . . *thousands* of torque converter tractors out in the field . . . *millions* of operating hours on every kind of work.**

TODAY'S tractor users have given their "stamp of approval" to torque converter drive—as a key factor in the new standards of performance they need for today's jobs. Here's why —

Automatic Matching of speed and pull to load and terrain conditions . . . more dirt moved every hour, day in and day out.

Hydraulically cushioned protection for engine, clutch, transmission, rear end. The entire tractor lasts longer! That means less downtime, lower maintenance costs.

Operators love it! Allis-Chalmers torque converter tractors are so easy to handle (most shifting is eliminated) that operators do a top-notch job all day long.

Yes, the industry's most experienced men are demanding and buying torque converter tractors . . . *and in this, Allis-Chalmers leads the way.*

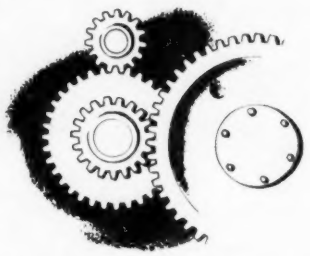
But, remember, you don't buy just one feature . . . you buy a *tractor,* with torque converter drive designed as a matched part of the entire machine. This advanced drive is only *one* of the many outstanding features that have switched so many users to Allis-Chalmers tractors. So . . .

Check all these features before you buy!

All-Steel Box-A Main Frame with one-piece, rear-end housing gives improved weight distribution, soaks up shocks, provides better equipment mounting, greater servicing ease . . . longer equipment life.

Service Simplicity of Unit Construction — Power drive components can be easily removed, repaired or replaced without disturbing adjacent parts . . . saving time and money.

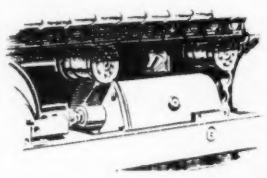
"Live" Sprocket Shafts — "Live" shafts with straddle-mounted bearings permit small, more serviceable seals. Double reduction final drives with smaller gears and shorter, heavier shafts mean extra ground clearance, better alignment, longer life.



1,000-Hour Lubrication — Tapered roller bearings and positive seals on truck wheels, idlers, support rollers and final drives extend lubrication intervals, cut downtime.

Hydraulic Booster Steering — Gives operator small tractor maneuverability with new ease. In addition, self-energizing brakes which take hold with a firm, uniform grip, provide exact control and sure safety with less pedal pressure.

True-Dimension Track provides maximum ground contact . . . plus the right design, the best steels for every job condition . . . heat-treated for long life with the industry's newest, most complete facilities.



Oil-Enclosed Track Release Mechanism — Operates in oil, seals out dirt and moisture, always in working condition to provide positive protection.

See your nearby Allis-Chalmers dealer now for the full story. Whether you're interested in a big tractor like the HD-20 or HD-15 . . . or the smaller HD-9 and HD-5, you can be sure of getting the most advanced tractor in the business, because Allis-Chalmers is the leadership line.

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

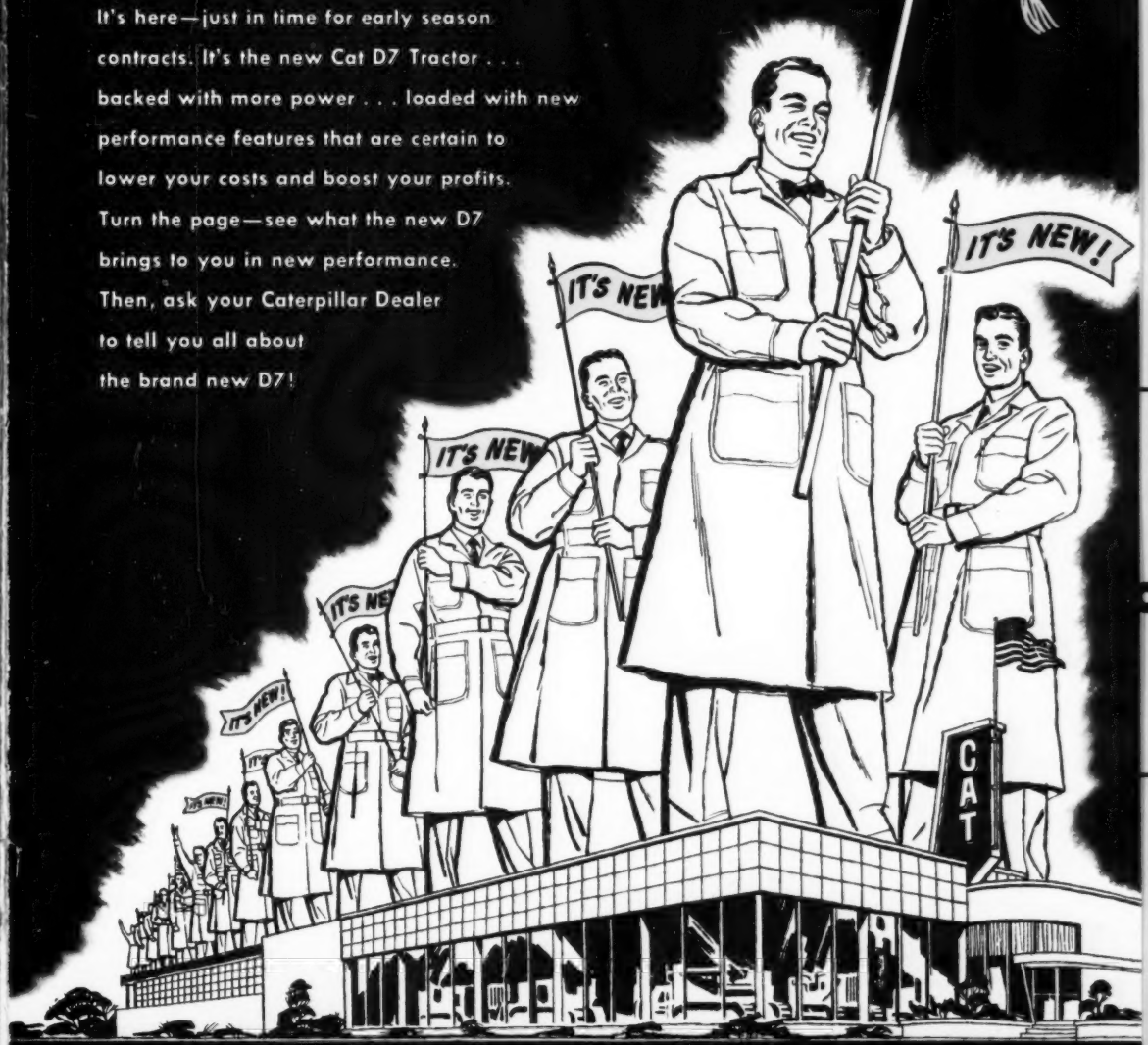
An Announcement by

YOUR CATERPILLAR DEALER

it's the New

CAT D7 TRACTOR

It's here—just in time for early season contracts. It's the new Cat D7 Tractor . . . backed with more power . . . loaded with new performance features that are certain to lower your costs and boost your profits. Turn the page—see what the new D7 brings to you in new performance. Then, ask your Caterpillar Dealer to tell you all about the brand new D7!



YOUR CAT DEALER'S NAME IS LISTED ON THE BACK PAGE — ASK HIM ABOUT THE NEW D7

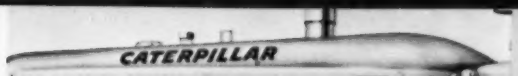
New **POWER**

New **STARTING ENGINE**

New **LONG LIFE**

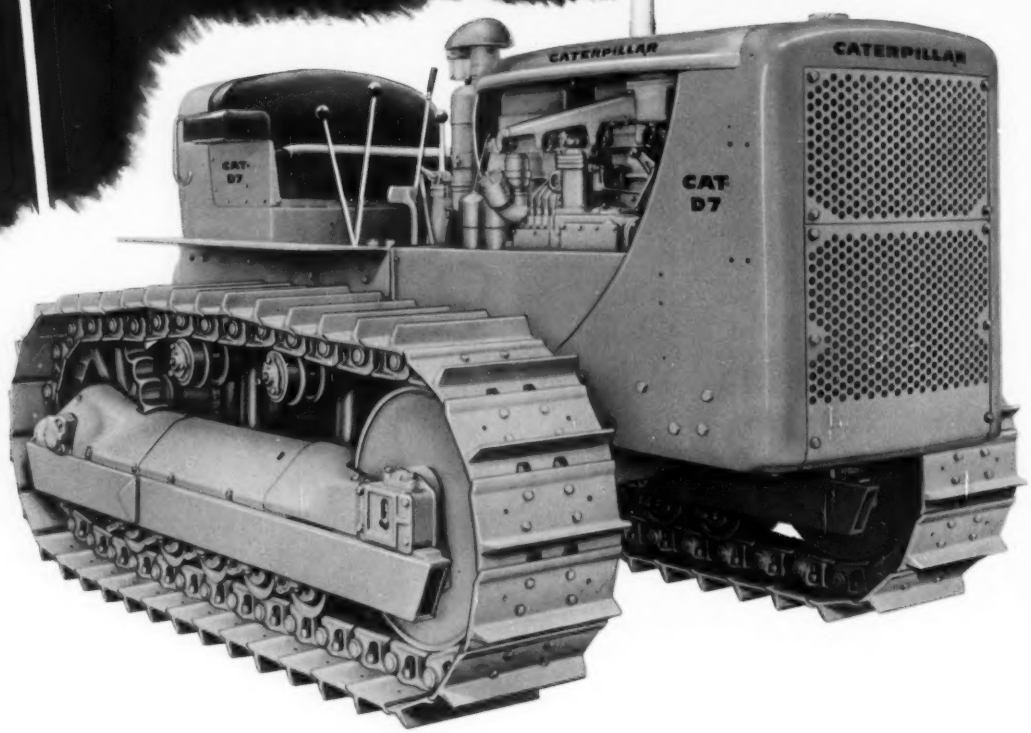
New **OPERATING COMFORT**

New **ECONOMY**



CATERPILLAR D7 TRACTOR

it's New!



LONG THE LEADER in its class, the popular Caterpillar D7 Tractor now steps further ahead. From engine to fuel tank, it's loaded with refinements and improvements that are certain to increase production and lower your costs. As the weeks and months and years go by, these important improvements will pay you dividends in longer life, lower fuel costs and, most important, more work capacity.

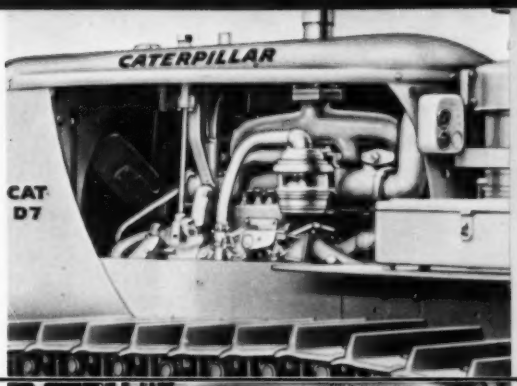
Add them all together. They represent the most wanted features by the men that put this power to work. They are the combined results of field demands backed by Caterpillar research.

There is matched equipment, too, designed to keep step with the new performance of the new D7.

We, your Caterpillar Dealer, are proud to present the new D7. Let us help you put it to work on your next job . . . let us show you what all of these new things mean to you in terms of profits!

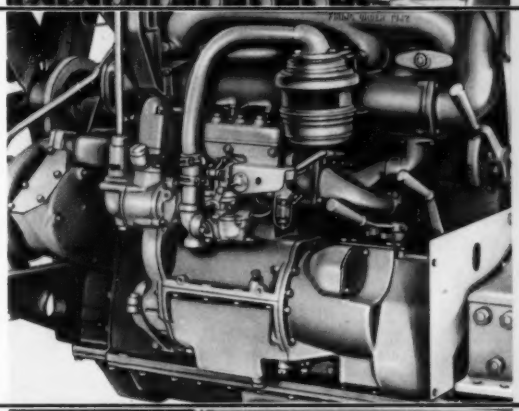
Look to Your* CATERPILLAR *Dealer

You'll gain extra yards and extra trips with the extra power in the new D7. Now, rated at 102 HP at the drawbar and 128 flywheel HP, with 28,700 lbs. maximum pull. There is added weight, too, to convert the new power to full tractive effort.



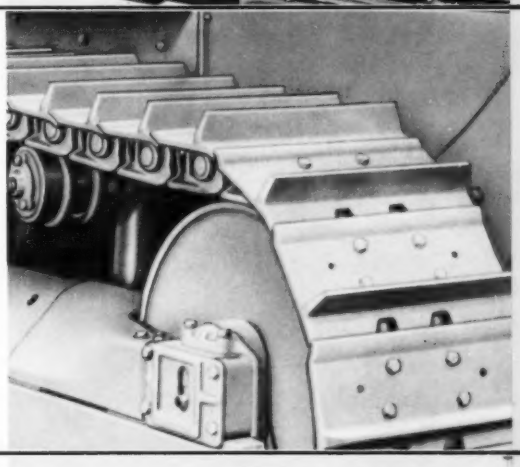
New POWER

Positive starting is yours in the new Caterpillar D7 Tractor. A more powerful gasoline starting engine has been developed to assure users of dependable operation under any weather condition.



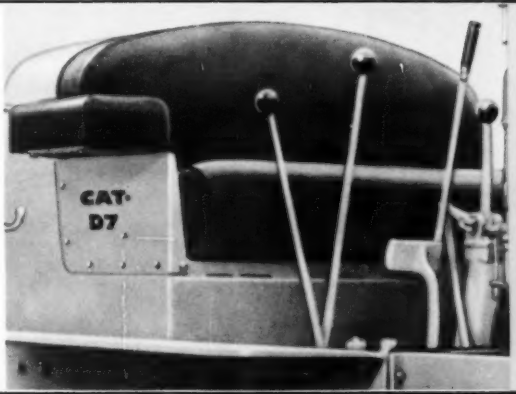
New STARTING ENGINE

Throughout the new D7, there are refinements you'll appreciate as the years roll by. New "water-quenched" track shoes that will last nearly twice as long, stronger block castings, larger water passages, a new center-thrust crankshaft bearing, a vibration balancer for smoother engine operation, elimination of all external oil lines . . . these are but a few of the long life features of the new D7.



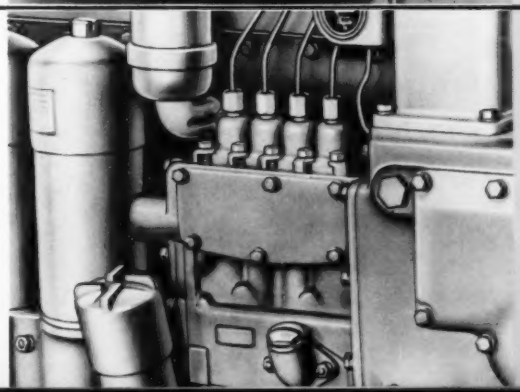
New LONG LIFE

Operators get a break, too, in the new D7. There's a new seat and back cushion for improved comfort. Controls are conveniently located. Big 85-gallon tank supplies fuel for 10 or more hours of normal use.



New OPERATING COMFORT

Never-ending Caterpillar research is ever producing cost-cutting fuel systems. A new fuel injection pump and new capsule-type fuel injectors skimp further on fuel, save more dollars in operating costs.



New ECONOMY

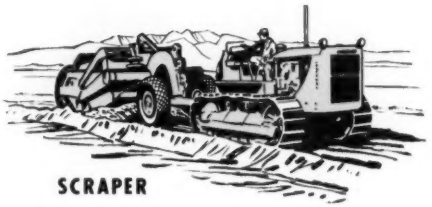
CAT® D7 TRACTOR

MATCHED EQUIPMENT
at your CATERPILLAR *dealer*

'DOZERS

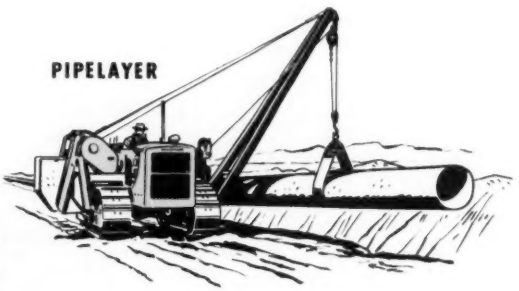
Matched 'Dozers, Scrapers, Rippers, Pipelayers, Cable or Hydraulic Controls are available for your jobs . . . they go hand in hand with the extra power and extra work capacity of the D7. Remember, too, all of these earthmoving tools are built by the same manufacturer . . . sold and serviced by the same dealer organization . . . designed for profits all the way.

Your Caterpillar Dealer, listed below, is ready now to plan your next job based on new D7 performance!

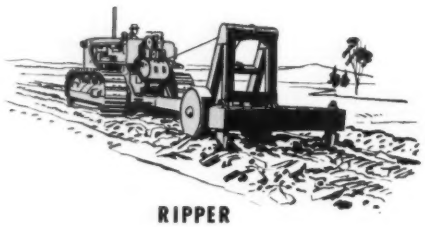


SCRAPER

FREE BROADSIDE — For more facts, ask your nearby Caterpillar Dealer for a copy of the new broadside that pictures the new D7. He will gladly mail you a copy without obligation. If more convenient, write direct to the factory for your copy — address Caterpillar Tractor Co., Dept. No. 435, Peoria, Illinois.



PIPELAYER



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CATERPILLAR®

COAL MINING

Vol. XXXII March, 1955 No. 3

Contents

Do You Know ---- 4

Here and There in the Coal Industry ---- 4

Coal Is A Mineral Storehouse ---- 5

Stripping Freeport Coal Near Beaver Falls, Penna. ---- 7

Torque Converters in Material Handling -- 8

Co-Dee Coal Company Augers Leatherwood Seam in Kentucky ---- 11

Reconditioning Tractor Parts ---- 12

Advertisers' Index ---- 20

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Manufactured in All Pipe Sizes
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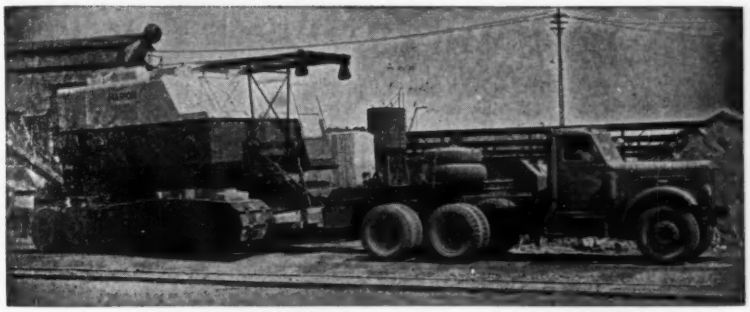
MOVERS OF COAL STRIPPING AND CONTRACTOR'S EQUIPMENT



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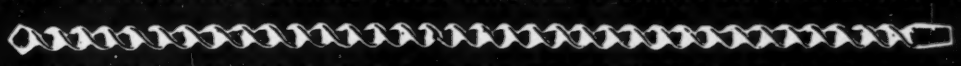
Phone ALlegheny 1-3600

SALEM "HERCULES" AUGERS FOR ELECTRIC DRILLS
Made To Withstand High Drilling Speed, Whip And Torsional Strain Of Electric Drills



Drills holes faster — Will not snap off shank or chip points — Outlasts four or five ordinary augers.

THE SALEM TOOL COMPANY SALEM, OHIO, U.S.A.

Do You Know?

● Automatic elevators that are "safer and more efficient than attendant-operated ones" were described at a meeting of the American Institute of Electrical Engineers in Boston.

The development is an automatic control that holds the doors steady until the last passenger has entered or left the elevator. In earlier versions of serve-yourself elevators the doors were timed to stay open a certain number of seconds, then started to close even if passengers were still moving in or out.

The electronic system developed by Westinghouse avoids false door movement and eliminates delay in waiting for doors to close when traffic is light, Walker G. White of the Westinghouse elevator division, said.

● Television is now working on the railroad, all the live-long day and night, to speed routing operations.

In the first permanent installation of its kind in the United States, two television cameras in a shed in the Potomac Yard in Alexandria, Va., keep their ever-vigilant lenses peeled for freight trains arriving from the south. As the train chugs through the shed at 10 miles an hour, the number and initials of each passing car are picked up and relayed to a TV screen in the record office two miles away. Floodlights make it possible for the cameras to operate day and night under all weather conditions. The clerk at the office reads the numbers from the screen into a tape recorder.

From this record, waybills can be processed more rapidly. Cars are then switched onto any one of the 49 northbound classification tracks and made up into new trains.

The new system replaces the conventional ground identification process, which yard officials said consumes considerably more time. They also estimate that the system will save the yard 40 per cent annually over the old method.

● The saying that if you are more efficient than you have to be, you will just get more work to do, holds true for electronic calculators too.

An airline device which has been doling out instant nationwide reservation information was found to have some "brain power" that was lying idle. So engineers have just given it a new, extra job.

The Reservisor is the machine's name and it will now also store on its magnetic drum "memory" up-to-the-minute information on arrival and take-off times for American Airlines flights. The conventional system used up until now has been a time-consuming, hand-to-hand operation.

In the new system facts are sent to the Reservisor about plane schedules with a special keyboard. Each tranmission takes a fraction of a second. After the machine's drum is loaded with coded information, late changes can be made.

When the reservations agent receives a telephone query, for instance, on what time flight number 40 will arrive, all he does is press a set of buttons and "ask" the Reservisor. Electronically, the machine searches its magnetic drum and flashes the answer back to the agent. On arrivals, the reply tells whether the flight is on time, and if not when it is expected.

As flight information is fed into the equipment, it is immediately available to all customer service agents in the New York-Newark, Idlewild area.

Here and There in the Coal Industry

● Norman B. Perkins, 76, operator of extensive coal properties in Eastern Kentucky and Tennessee, and one of the organizers of Appalachian Coals, Inc., died in Orlando, Fla. A resident of Williamsburg, Ky., he was executive vice president and general manager of the Southern Mining Co.'s group of mines in Bell County, Ky., and president of the Perkins-Bowling Co. in Knott County, Ky. He was also chairman of the board of the Perkins Harlan Coal Co. of Williamsburg and secretary of the Southern Coal and Coke Co., Knoxville.

● J. F. Lake, president of Osage Coal Co., Stemboat Springs, Colo., was elected president of The Colorado & New Mexico Coal Operators Association at the annual meeting held in Denver Jan. 26. Other officers elected: 1st Vice President—J. S. Besser, manager of sales, Fuel Department, Colorado Fuel and Iron Corp., Denver; 2nd Vice President—Claude P. Heiner, president, Minerals Development Corp., Salt Lake City; Treasurer—O. M. Hanks Colorado and Utah Coal Co., Denver.

● A one-room, portable house that can be erected without the aid of tools or skilled labor received patent No. 2,701,038.

The portable house is capable of being hauled around on a truck. It is also designed to rest on skids that make it possible for the owner to shift the house from one local site to another if he desires.

Made of lightweight sheet metal, the structure which unfolds from one piece was invented by Clyde F. Mooney of Tulsa, Okla., who assigned his patent right to the Flint Steel Corporation of that city.

George H. Deike (left), who has labored 44 years to make mining a safer occupation, receives the Erskine Ramsay Gold Medal Award at the annual meeting of the American Institute of Mining & Metallurgical Engineers in Chicago, Wednesday night (2/16.) Presenting the award "in recognition of Mr. Deike's achievements in bituminous and anthracite coal mining" is AIME president Leo F. Reinartz, vice president of Armco Steel Corporation, Middletown, O. Mr. Deike is a founder and board chairman of Mine Safety Appliances Co., Pittsburgh, world's largest producer of safety equipment for all industry.

Airdox shot coal in the Pittsburgh Coal Seam, lying west of Pittsburgh, Pa.

COAL IS A MINERAL STOREHOUSE

By HOWARD SIMONS
Science Service Staff Writer

Coal-using industries in the United States are literally throwing away many of the earth's rare and minor elements.

This unintentional waste occurs because of coal, in addition to its heating qualities, is also a natural storehouse for several of the world's lesser known, but valuable metals such as cobalt, germanium, molybdenum, lanthanum and yttrium.

And, the day may soon come when coal is mined for these materials as well as for fuel.

Scientists in this country and elsewhere have already found and recorded varying amounts of more than 60 elements in coal ash.

Finding these elements in coal means that this black, lifeless lump of earth that has warmed man and moved his machines for centuries now offers both science and industry new uses for coal production and utilization.

Primarily, it means that the nation has a ready-made reservoir of these metals for use in time of emergency. But perhaps of equal importance, the presence of these elements in coal means, too, that the coal industry itself may some day produce a valuable by-product that can help prop up its sagging economic structure.

For scientists, the study of these coal-bearing elements has already provided new and important insights into the relatively young field of geochemistry. And for the mining engineer and geologist, these elements hold a potential means of correlating coal beds and estimating coal reserves, as well as new mineral ore deposits. Agriculture, too, can utilize coal ash containing minor elements.

Under a program started in 1948, scientists of the Geological Survey of the U. S. Department of Interior have been conducting a systematic survey of major coal beds in the United States.

The survey is now almost 75% complete, and it is believed that it will be finished within the next few years.

Although anthracite, bituminous and lignite beds throughout the United States have been studied, the scientists are careful to point out that not all coals contain elements. Nor are all the elements found in every sample. The number of elements and quantity estimates for a particular coal field vary greatly.

They do emphasize, however, the fact that where the elements are found in concentrated amounts, it would be economically practical to consider these reservoirs as a potential source for mining the metals.

During a global war, many of the major sources of many of the minor metals found in coal may be cut off. When and if this happens, the nation's industry will be forced to rely on domestic sources, or substitutes. The survey now being conducted will help to insure a flow of many of these elements in just such an emergency.

But for the present, these locked-in-coal metals hold a much more timely promise. Inadvertently, industries that use coal for both fuel and non-fuel uses disregard the minor elements which could be recovered.

Scientists are confident that modern technology, if applied, could produce the necessary means for utilizing coal for its fuel value and, at the same time, collect the minor elements.

At present, there is no comparable set-up for this process in the United States.

This, of course, does not mean that every coal-using homeowner should immediately begin to save his ashes somewhere in the basement. Nor does it mean that every lump of coal represents dollars and cents in mineral content.

Because some of the elements are very volatile and a goodly per-

centage of the element is lost during burning, ordinary furnace methods for getting coal ash containing the metals are impractical.

Only as an illustration that the metals can be derived from coal, three possible methods have been suggested.

One means would be to collect the elements from the flue dust that goes up the smokestacks. This is analogous to the method by which germanium, the electronics-age metal, is now collected from zinc-smelting operations.

Another means would be to ash the coal directly at controlled temperatures as is now being done in the laboratory experiments with coal samples.

Still another way to save the metals would be to re-work the millions of tons of tailings discarded after coal has been used by the chemical industries for non-fuel use, such as in the manufacturer of coal tar, dyes, etc.

The study of the elements-bearing coal has already been put to use to help a feared metals shortage. In 1951, the electronics industry was using germanium in the manufacture of crystal diodes and transistors at such a rapid rate that it was thought that domestic sources would soon be exhausted.

As an illustration of the potential importance of germanium in coal, only one aspect of the minor elements in coal search, the Geological Survey published a progress report, circular 272, outlining the known concentrations of germanium in the coal ash of American coals, as recorded up to that date.

It is only because new sources of germanium, other than that treasured in coal, were found here and abroad that the mining of coal for germanium was arrested. However, coal still remains a very vital and potential source of this metal.

To determine just what elements and how much of them are in a particular coal bed, the government geologists cut samples from the fresh face of a coal bed. After being cut, the sample is marked and sent to the laboratory.

Back in the laboratory, each sample is divided. One half is saved for possible petrographic and chemical study, and the other half is powdered.

The powdered coal is then placed in a cold muffle furnace and subjected to a gradually rising heat, not allowed to exceed 450 degrees centigrade. The ordinary home furnace reaches temperatures of more than 1,000 degrees centigrade.

The pulverized coal is in this way ashed, and the loss of the elements by burning kept to a minimum.

After ashing, the coal is sent to the spectrographic laboratory, where photographic fingerprints of its composition are made on film plates. The laboratory also determines the percentage of each element found in the coal ash.

Coal ashes have been found to vary greatly in their metal content and make-up, even from one seam to the next.

In this manner, the government geologists and spectrographers have identified and recorded 17 minor elements which they believe to exist in sufficient quantity to be economically important.

A spectrographic picture made from a 4.52% ash of a sample taken from an Indiana mine showed, for example, that the ash contained the following elements, given in grams per ton, estimated for the coal field: beryllium, 100; boron, 5,000; titanium, 2,000; vanadium, 90; chromium, 200; cobalt, 200; nickel, 1,100; molybdenum, 30; copper, 800; gallium, 40, germanium, 600; and yttrium, 100.

Spectrographic pictures of the elements, which appear as lines of varying widths on the film plate, can also be used by mining engineers probing for coal seams. Oftentimes, a seam will "pinch out," that is will disappear and crop up again somewhere above or below the worked out seam, being separated by bedrock. "Pinching out" had beeen caused by geologic forces at the time the coal was forming.

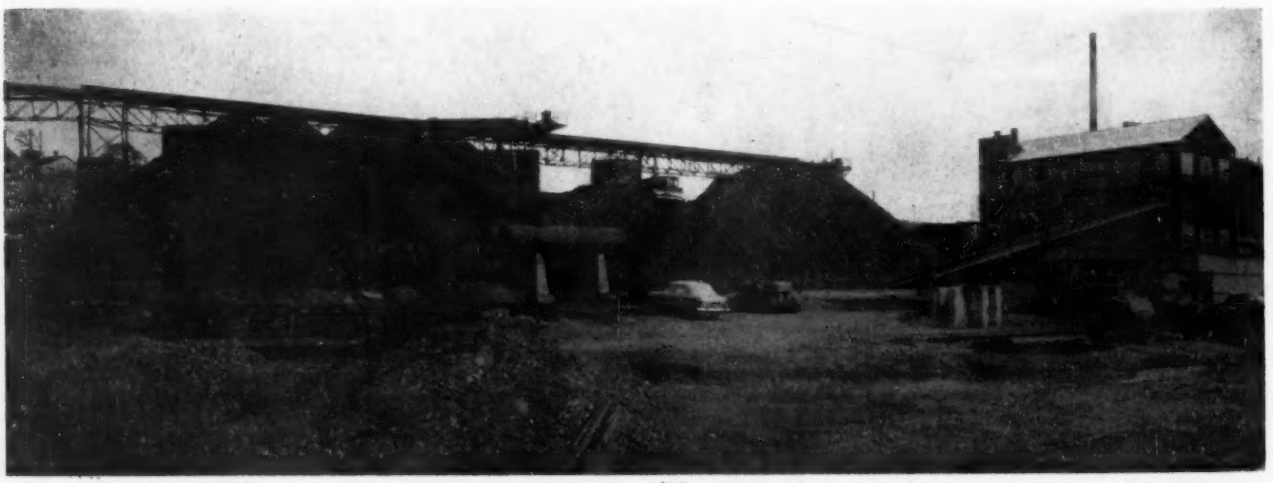
Mining engineers may find that spectrographic methods will give them a more perfect tool for correlating these old and new coal seams, as well as coal beds themselves.

The minor elements might also prove valuable in leading prospectors to new or extensions of old ore deposits.

During the Survey's work with germanium in coal ash, it was found that a factor of great significance in explaining the variations of mineral content is the presence of mineralization adjacent to or within coal fields. There are, for example, zinc deposits near the germaniferous coal beds of Stark and Athens Counties in Ohio.

Plants need certain minerals for their systems. Oftentimes, soil in

(Continued on Page 15)



Disco plant of the Pittsburgh Coal Company, near McDonald, Pa. Fine coal is used to make a low volatile house heating fuel to meet requirements of Allegheny County. Raw Tars and gases are recovered in the process. Tar is sold but the gases are used in the manufacturing process. Disco is also used as a reducing agent.

Looking into the pit toward the stripping shovel.

Stripping Freeport Coal Near Beaver Falls, Penna.

Located near Beaver Falls, Pennsylvania, the North Sewickley Coal Company is stripping an unusual deposit of Freeport Coal running about 50 inches in thickness. This seam contains a parting about 15 inches from the top that is similar to the parting in the double Freeport lying along the Allegheny River.

Highest overburden on the deposit runs about 25 feet and consists of blue shale directly on the coal, 10 to 15 feet of sandrock, yellow shale, then top soil.

Stripping is done with a Model 1201 Lima shovel having 2½ cubic yard Esco dipper. No shooting of the overburden is done.

Loading of the coal is done with a Lima Model 802 shovel, equipped with 1 cubic yard Esco coal loading dipper.

Water in the pit is pumped with a 4-inch Jaeger gasoline driven Pump. The output is hauled to the company deep mine in the vicinity where it is put through a preparation plant to prepare it for market.

Close up view of the water pump.

Close up view of the stripping shovel.

The coal loading shovel.

TORQUE CONVERTERS IN MATERIAL HANDLING*

By P. L. FOSBURG
Manager of Engineering, Torque Converters
Westinghouse Electric Corporation

A torque converter may be defined in several ways, depending on whether you think of it in terms of function, application, or precise description. It can be called an automatic compensator for changes in output torque demand. A more precise description might term it an infinitely variable torque amplifier. In terms of application, it is a device to permit the prime mover to deliver essentially constant horsepower at constant speed for maximum efficiency of the input drive. Finally, classically defined, it is a hydraulic analogue of an electrical generator and electrical motor.

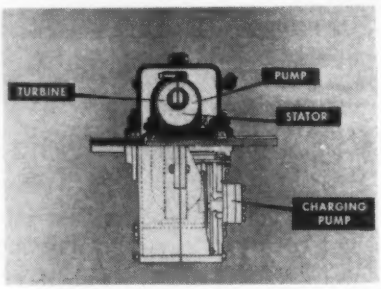


Fig. 1—This cross section shows the relative positions of the main components of the torque converter.

It is interesting to trace the history of the torque converter. In 1912, the Germans were faced with a problem in designing marine gear for large horsepower applications. At that time, there were no gear reducers capable of transmitting the large horsepower required. To circumvent this difficulty, they started work on a hydraulic device which would accomplish this reduction with maximum efficiency. Although this device was not a torque converter as we know it, it was based on the same concept that we use today. The first actual use of the torque converter was on small locomotives which were built and used in Europe. They were found to be necessary because of the short hauls over mountainous terrain. The cost of electrical drives for this type of rail car were prohibitive.

The first application of torque converters in this country was not made until the late thirties. At that time, they were applied on small switcher locomotives because of the economy and simplicity of design. In the early forties, considerable work was done on bus drives using electrical power as well as hydraulic means. It was found that the torque converter was the most economical application for a drive of this sort. During the war, this same type of transmission was used on military tanks. Later on, the torque converter was adapted to various off-highway applications where starting torque demands are rather high, such as on the trucks which are used on the iron range.

Of course, we all know what has happened to the transmissions on passenger cars in the last five or six years. The trend across the industry has been to incorporate torque converters in all models. Recently there has been a growing application in both the automotive and industrial fields and interest in this device and its application has been expanding at a rather rapid rate.

How does the torque converter work? It consists principally of three basic elements: pump, turbine, and reaction member, fig. 1. The centrifugal pump converts the mechanical energy of the driving engine or motor into kinetic energy in the fluid being circulated. This fluid then enters the turbine wheel and gives up its energy in the form of torque and rotation. As the fluid leaves the turbine, it enters the reaction member where the direction of flow is reversed so that the oil, with its unexpended energy, enters the pump in the same direction as its rotation. If this reaction member were not present, the direction of fluid emerging from the turbine would be in a direction to oppose the action of the pump and would prevent the multiplication of torque. At the stall condition, when the output member is stationary, the energy in the fluid impinging upon the turbine is converted into torque. As the turbine starts to move, this torque decreases until such time as the turbine approaches the same rotational speed as the pump wheel. As the speed of both pump and turbine approach synchronization, the torque multiplication decreases to unity and we then have the equivalent of a fluid clutch or flywheel. When this condition occurs, the blades of the reaction member are in such a position as to obstruct the flow of oil. This would result in a sharp decrease of torque and efficiency if no corrective measures were taken. When this occurs, we permit the reaction member to free wheel in order to get it out of the way of the fluid flow so that the fluid may pass unimpeded through the hydraulic circuit.

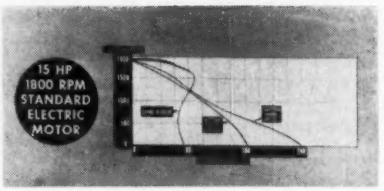


Fig. 2—A 15-hp motor performance curve with the bare motor, an 11-inch converter, and a 12-inch. The thicker portion of the bare motor curve shows the output and torque of the motor when the output shaft of the converter is stalled. The torque value is about 60 lbs.-ft. with the 11-inch converter and about 80 lbs.-ft. with the 12-inch.

The hydraulic circuit is completely enclosed and sufficient charging

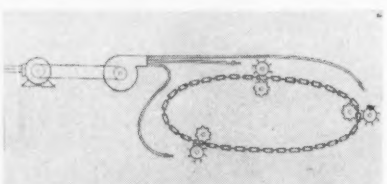


Fig. 3—This analogy demonstrates how the torque converter can be used to equalize loads between two or more parallel prime movers.

*Presented at the 5th Biennial Materials Handling Conference, sponsored by the Westinghouse Electric Corporation; Columbus, Ohio, February 1 and 2, 1955.

pressure is provided by a separate pump to assure that the circuit is completely full of oil at all times. This is done to prevent cavitation. Since the input and output torque are different, this difference must be balanced by a reactive force. This reactive force is provided by having the reaction member fastened to the external housing. Provisions for cooling the oil are made. This can be done within the unit or externally through a separate heat exchanger.

Proper matching of the torque converter to the prime mover (electric motor or internal combustion engine) is not only an important aspect in the application of this device to a specific problem but also grooves a good insight into both performance and operating characteristics of the torque converter. Different diameters of converters have somewhat different characteristics at the output when applied to the same prime mover. Typical speed torque curves of a 15-hp, 1800-rpm standard squirrel cage motor, the same motor with an 11-inch single-stage torque converter, and again with a 12-inch converter applied to it are shown in fig. 2. The starting torque on the standard motor is approximately 74 lbs.-ft. This reduces somewhat as the speed in-

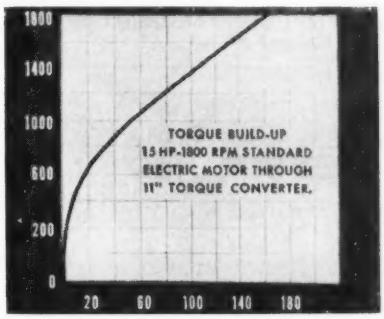


Fig. 4—The torque build-up on a 15-hp motor with an 11-inch converter, This size converter would be a good choice for a heavy inertia, hard-to-start load.

creases until the output reaches 110 rpm. The pull-out torque on the motor reaches 90 lbs.-ft. at a speed of 1500 rpm, and the full-load torque of 45 lbs.-ft. is reached at 1745 rpm.

When the input shaft of an 11-inch torque converter is directly connected to this motor, the speed torque characteristics at the converter output shaft can be shown by the dotted line in fig. 2 The dashed line shows the performance through a 12-inch diameter torque

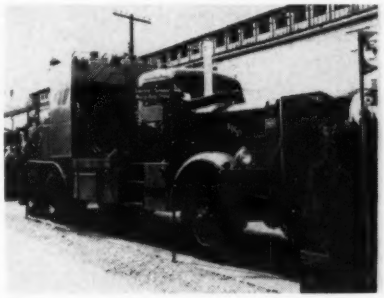


Fig. 5—One of the material handling applications where the torque converter has been extensively applied is in heavy-duty road trucks. This torque-converter equipped GM diesel has four-wheel drive.

converter. Points A and B on the motor curve represent the speed and torque of the motor when the output shaft of the converter is stalled (point A being for the 11-inch and point B being for the 12-inch converter). Through the 11-inch converter, the starting torque reaches 164 lbs.-ft. when the motor is running at 1720 rpm and developing 58 lbs.-ft. of torque. This means, then, that the motor is running with very little overload but the converter has made available considerably higher torque for starting and accelerating a load. The 12-inch converter, when stalled, pulls the motor speed down to 1620 rpm where its torque is 80 lbs.-ft. This greatly reduces the time at which this motor could run with the converter output stalled and without the overload switches acting to shut the motor off. We would assume then, that if we had a problem of powering a load which required a higher break-way torque to overcome friction, but one that would not have excessive inertia to be accelerated, we could well use the 12-inch torque converter. On the other hand, if the load was reasonably hard to start and had heavy inertia to accelerate, we would be inclined to use the 11-inch converter so that we would not impose so much overload on the motor during the accelerating period.

In some cases, consideration is given to using the converter as a torque limitation device. Here, the converter must be selected so that its output will not exceed the torque desired at the stall condition. As a sidelight on this particular consideration, the results of some shock absorption tests, conducted in the past by various companies, have shown that, in many cases, design safety factors may be reduced as much as 75 percent when using a fluid drive rather than a straight mechanical drive. This permits the designer to design his machinery and power transmission systems more for the running loads than for starting or shock loads. Of course, this will result in reduced materials and prices for the machinery.

When studying the performance curves on torque converters, it will soon appear obvious that the converters will assist in paralleling two or more prime movers on one driven load, fig. 3. When one prime mover tends to speed up, it naturally tries to assume more than its share of the load. Due to the characteristics of the fluid drive, however, it cannot pull the other prime mover as would be the case with direct mechanical drives. Eventually, the units will assume their proportion of the load and work together as a team. A good example of this type of application is the long chain conveyors used in many factories. In many cases, these chain conveyors are long enough to make single motor powering from one location impractical and multiple power units must be used. Controls and synchronization on the electric motors on such multiple powered conveyor systems can be very expensive to insall and hard to maintain. The use of the torque converter on these systems greatly reduces both initial cost and maintenance problems. It can also offer another advantage. When one of several units became inoperative, the conveyor could still be operated at a reduced speed, since each motor-converter power unit would be capable of assuming an extra torque load at a reduced speed.

Another application which can be considered concerns torque converters for industrial trucks powered by internal combustion engines. Many such trucks are called on to work in warehouses where the aisles are rather narrow and where

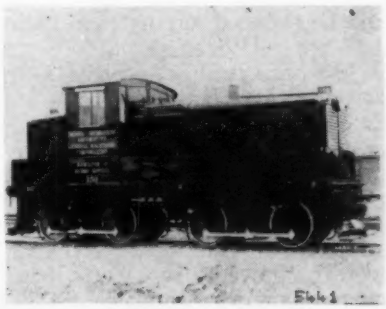


Fig. 6 — Locomotives, particularly switchers, lend themselves readily to torque converter applications.

a considerable amount of close moving is required. The torque converter eliminates the need for a clutch to inch the vehicles around in small spaces. Since the converter also multiplies torque, in most cases it will eliminate the requirement for a multiple-gear transmission. The converter can work at partial throttle conditions where light loads are encountered or it can operate at full throttle where high torque is required for negotiating ramps or soft surfaces. Since the power is applied gradually when the engine changes from idle to full speeds, the tendency to slip the wheels is greatly reduced. According to Mr. M. W. Hagen of the Buda Company, Division of the Allis - Chalmers Manufacturing Company, in his paper entitled "Experts Give Fork Trucks a Going Over" in December, 1954, issue of the SAE Journal: "Fluid drives will increase tire life by approximately 3 to 1. They will do an even better job for clutch life. Control is superior when inching a load into position, and the elimination of starting jolts pervents damage to the load."

One example of what can be accomplished through the use of a torque converter can be described by a case that involved a blending machine. This particular application required that the machine have a rather high starting torque to get the mixer in motion. As originally designed, this required a 40-hp electric motor. Measurements of horsepower requirements on the actual installation showed that the running horsepower was only 13½ hp. A fluid clutch between the driving motor and the machine was tried and it was found that the motor size could be reduced from 40-hp to 30-hp. Having made this start, it was decided to see what could be done by putting a torque converter on in place of a fluid clutch. When the torque converter was installed, it was found that the horsepower of the driving motor could be reduced again from 30-hp to 15-hp. Altogether, the motor size had been reduced by more than 260 per cent. It so happened on this particular job the reduction in size of the motor, as well as the reduction in size of the transmission, made the cost of the installation less than the cost of the original equipment. The main savings, however, showed up in the reduced power consumption of the unit.

There are undoubtedly many other such applications in various material handling problems. In general you will find that torque converters can be used to great advantage wherever:

(A) High starting torque and low running torque are required to do the job.

(B) Shock loads present a problem and maintenance, as a result of this type of loading, is costly.

(C) It is desired to reduce peak starting current and improve power factor.

(D) Variations in loading must be quickly and accurately compensated for without affecting the efficiency of the prime mover.

Since a torque converter is a torque amplifier and output speed is dependent upon the load, it should not be used on an application where speed regulation is the prime requisite unless other means are provided to furnish speed regulation.

Where a torque converter is properly applied, it will result in improved performance, ease of operation and, in general, economy of operation based on the work perfromed.

● A new brochure describing the operation of General Motors "6-110" Diesel engines and illustrating industrial and marine models in the series from 200 to 275 horsepower is ready for distribution by Detroit Diesel Engine Division distributors and dealers.

Entitled POWER FOR PROGRESS, the brochure covers features of design, specifications and power curves of single-, multiple-engine and torque converter units and includes photos of these engines at work in various types of equipment.

● A new four page bulletin illustrates and describes many exclusive Le Roi features found on the 85 cfm Airmaster.

A cross section view of the one unit engine-compressor design, shows how the single cooling system, one lubrication system, and one crankcase and crankshaft simplify any maintenance which might occur.

Magneto ignition, replaceable wet type cylinder sleeves, tight sealing sides for tool and hose storage, and water cooled manifold are other time and money saving design points which are brought out.

Specifications are given for the compressor and engine. Tool capacities are included as well as weights and dimensions for skid and wheel mounted units.

Copies of the bulletin can be obtained from: Sales Promotion Department, Le Roi Division Westinghouse Air Brake Company, 1706 South 68 Street, Milwaukee 14, Wisconsin.

● Recent engineering development at Caterpillar Tractor Co. have resulted in an increase of horsepower ratings for the Company's D397, D386, D375 and D364 Diesel Engines. The "continuous" ratings of these engines will be up to and including 1200 r.p.m. The "intermittent" curve is now extended to 1300 r.p.m.

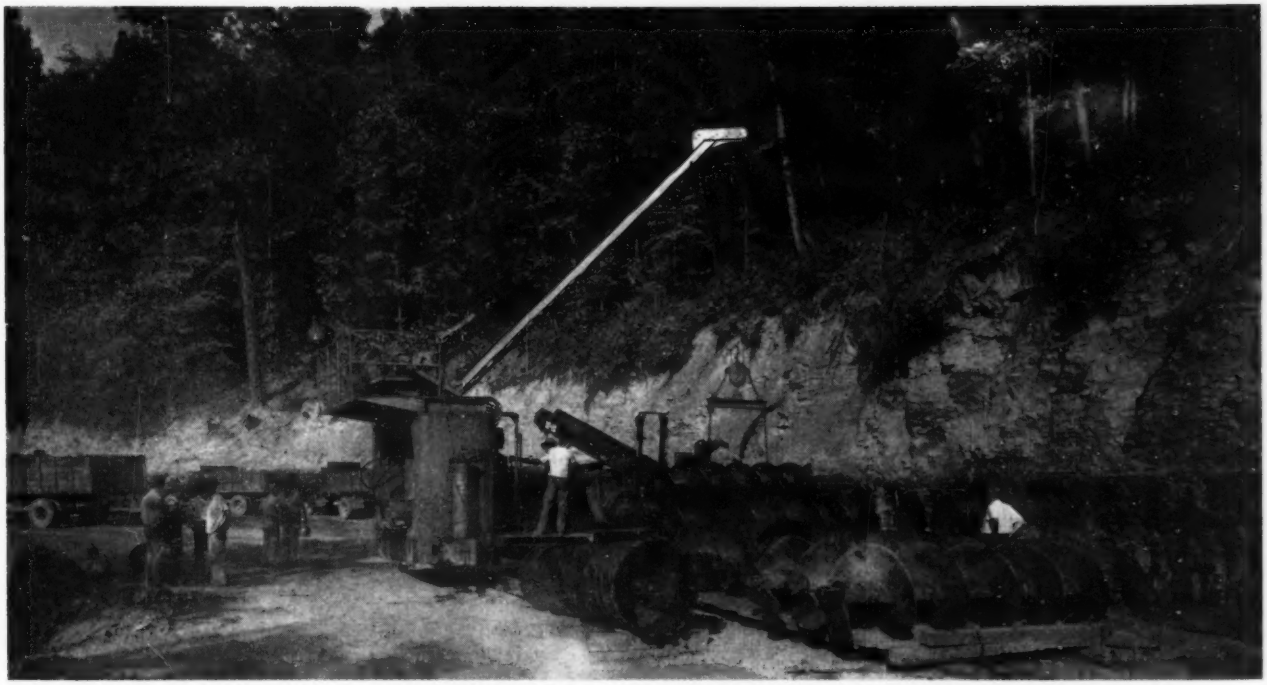
The "continuous" and "intermittent" horsepower ratings of the four sizes of engines offered as Diesel Industrial Engines are as follows:

	D397	D386	D375	D364
1200 R.P.M. (Continuous)				
Without Radiator Fan	450HP	360HP	302HP	238HP
With Radiator Fan	430	340	284	220
1300 R.P.M. (Intermittent)				
Without Radiator Fan	520HP	415HP	350HP	275HP
With Radiator Fan	493	388	328	253

The "continuous" ratings of these engines offered as diesel electric sets are as follows:

1200 R.P.M.				
Without Radiator Fan	315KW	250KW	210KW	165KW
With Radiator Fan	295	230	200	155
1000 R.P.M.				
Without Radiator Fan	275KW	215KW	173KW	140KW
With Radiator Fan	265	205	173	135

The company also announced that marine gears for the new increased horsepower D397, D386, D375 and D364 Diesel Marine Engines are available.



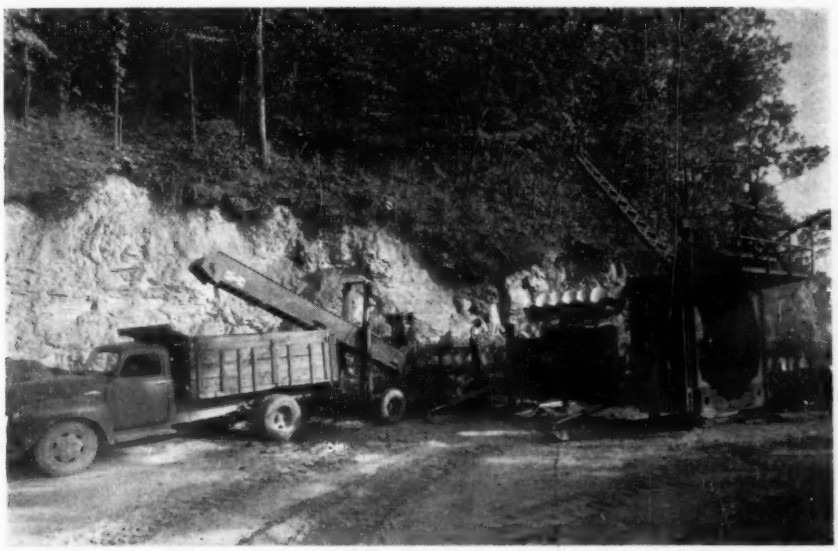
Showing the Auger placing 12 foot extension with crane. Spare cutting head can be seen in foreground.

Co-Dee Coal Company Augers Leatherwood Seam in Kentucky

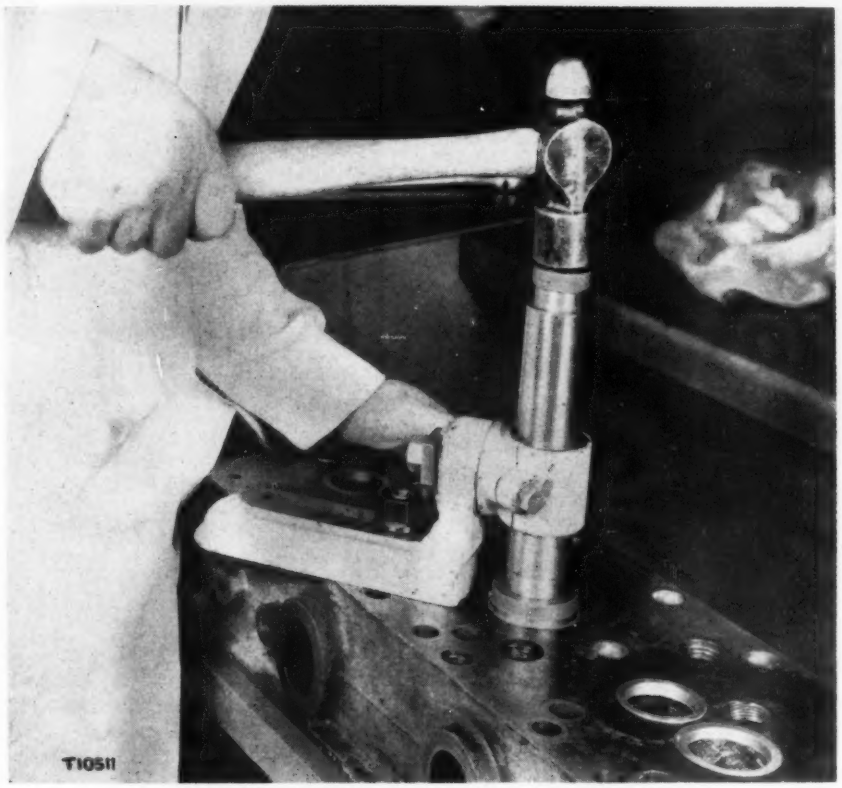
In the Southern coal field some auger coal producers are opening virgin coal land by using a tractor to reach the seam of coal and mining it with augers.

The Co-Dee Coal Company near Hazard, Kentucky, uses a late type McCarthy auger to mine the Leatherwood seam which averages 50 inches in thickness. Augers are 12 ft. long and are handled by a crane attached to the machine. Augers are 36 in. in diameter and are equipped with hard tipped bits.

In mining the augers make 100 foot long holes and produce 200 tons per shift which consists of a four man crew. Two shifts are worked each day, producing 400 tons of coal with the one machine.



Looking at the machine from the truck loading side.



Installing valve seat inserts in cylinder heads.

Reconditioning Tractor Parts

BY D. R. LAMMERS, *Service Manager*
Caterpillar Tractor Co.

Now that new parts are readily available, machine owners should carefully consider the value of reworking worn parts. Many ingenious methods of rehabilitating worn tractor parts have been practiced in recent years. Some of these salvage methods proved to be practical and economical, while others were expensive but necessary to keep badly needed machines in operation.

Many reconditioning practices are so practical and have been universally used so long that we forget to classify them as such. Among these are regrinding crank-shafts, turning track pins and bushings, and reboring and sleeving bearing bores in transmission cases and final drive covers.

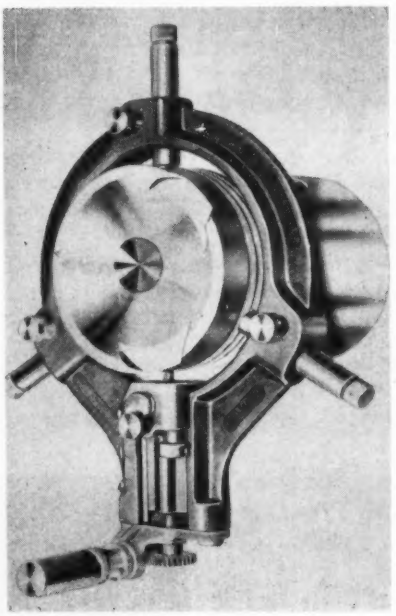
Etching and raising the ridge in worn cylinder liners, using wide top compression rings on worn pistons, and installing valve seat inserts in cylinder heads are common salvage practices on engine parts. The practices of hard-facing cutting edges and bucket teeth, straightening sheet metal guards and hoods, and building up with electric weld worn spots on heavy fabricated steel parts will remain popular because of their economical value.

D. R. LAMMERS

Other practices have become common due to parts shortages in the past and will continue to be popular because they have proved to be practical. Included in this group are the building up of track grousers, track rollers, idlers and sprockets, and regrinding track roller shafts using undersize bushings.

Welding new rims on sprockets, building up the outside of worn steering clutch drums or using extra-thick brake linings, and installing clutch drive rings in flywheels have also become widely accepted. The simple taper pin method is common for the repair of cracked cylinder heads.

Track links have been built up with electric welding rod which has been entirely successful but the economy of this operation is questionable. The advisability of repairing track links by this method can best be determined by local experience.



Regrooving top piston ring.

Obviously, if a part can be reconditioned for much less than the cost of a new part and if the reconditioned part functions properly with a new life expectancy approaching that of a new part, the owner will prefer to have the part reconditioned. Many times, however, it will prove to be better to purchase new parts.

Some reconditioning procedures are practiced which are believed

to be definitely not advisable. Foremost among these is the repairing of fuel injection pumps. This frequently results in inaccurate fuel injection timing because of variations in dimensions of fuel pump bodies. Repairmen invariably neglect to compensate for these variations. The discrepancies in timing usually are not great enough to cause noticeable malfunction of the engine but could easily nullify the saving by increasing the fuel consumption or rate of depreciation of other engine parts.

An owner will spend less for fuel injection pumps by buying new pumps only when the old pumps are worn enough to cause hard starting or a noticeable lack of power.

Regrinding crankshafts to intermediate undersizes is another example of false economy in reconditioning parts. It is recommended to use the shaft until it is worn enough that it should be reground to the standard undersize. Regrinding long before the crankshaft reaches this point is unnecessary and a waste of money. It also requires additional labor in the special fitting of bearings.

In summary, the practice of sound, economical parts reconditioning results in better and lower cost service for machine owners.

● Resignation of Hugh A. Cameron as General Sales Manager and the promotion of William H. Dickey as his successor, have been announced by George N. Beckwith, President of Beckwith Machinery Company, earthmoving equipment distributorship with executive offices in Pittsburgh, Pa.

With more than 33 years service in the Sales Department of Beckwith, Mr. Cameron will retire on February 1, 1955. He joined the company in October of 1921 as a salesman in the Cleveland, Ohio office and then was transferred to the Philadelphia, Pa. office in 1925. It was in this year that the merger of Best and Holt interests was made to form the Caterpillar Tractor Company and Mr. Cameron was greatly instrumental in pioneering the use of the track-type tractors with bulldozers and scrapers in the construction industry.

As a result of a change in dealer territories, Mr. Cameron returned to the Pittsburgh plant in 1928 as part of the sales staff. In 1935 he was promoted to the post of Branch Manager at Wilkes-Barre, Pa.

The position of General Sales Manager was awarded to him in 1946 and he returned to Pittsburgh, Pa. He has directed the activities of over 25 men in the Sales Department for the last 8 years and is widely known through the earthmoving industry. He is married and has two daughters. He is a member of the Sales Executive's Club, the Pittsburgh Athletic Club, South Hills Country Club and is a Shriner as well as a Thirty-Second Degree Mason. Mr. Cameron's immediate plans include a long trip to California and Hawaii.

WM. H. DICKEY

In filling the position of Beckwith General Sales Manager, William H. Dickey, at the age of 35, becomes one of the youngest General Sales Managers in the heavy equipment industry. He attended Colgate University and joined Beckwith Machinery Company in 1946 as a line salesman. In 1948, he was elevated to the post of Branch Manager at Clearfield, Pa. Since 1952 he has served as Pittsburgh Sales Manager.

● A new "grizzly" screen attachment, suitable for installation on all hydraulically-operated Austin Overshot Loaders, is announced by the Austin Division, Central Ohio Steel Products Company, Galion, Ohio.

Using the new screen attachment, Austin Loaders can dig, screen and load pit-run gravel, coal and other materials into trucks in one operation, the manufacturer states. Gravel, as loaded, is ready for spreading on roads without additional screening. Oversize material is dumped alongside the truck.

Equipped with a "grizzly" screen attachment, an Austin Overshot Loader can dig, screen and load as much as 4 cubic yards of material every 20 seconds.

A variety of screen sizes are available. Attached by 8 heavy bolts and readily installed or removed, the screen attachment is also reputed to be an effective means of screening out fines when loading rip-rap or other coarse material.

Using a "grizzly" screen attachment, this Austin Overshot Loader dumps screened gravel, ready for spreading, into the haul truck. Oversize material is deposited alongside the truck.

Since separate screening equipment is not required, it is claimed that substantial savings in labor, hauling and equipment costs can be realized through the use of screen-equipped Austin Overshot Loaders.

Available in capacities of 1 to 4 cubic yards, and suitable for mounting on Model D-2, D-4, D-6, D-7 and D-8 tractors, Austin Overshot Loaders are sold and serviced through Caterpillar tractor distributors everywhere.

Further information can be obtained from Caterpillar representatives or direct from Austin Division, Central Ohio Steel Products Company, Galion, Ohio or 2 Santa Fe Drive, Denver, Colorado.

● Announced by LeTourneau-Westinghouse Company as the first new machine completely designed and built by the new company is the B Tournapull—a 23 yd. single-engine, self-propelled scraper.

Developed by the company's new engineering and research staff, it is a machine that is brand new from the ground up.

Struck capacity of its Model B Scraper is 18 yards—its heaped capacity 23 yards without sideboards. The overall length of the B Tournapull is 40′ 6″. It is 11′ 8″ wide and 12′ 7″ in height.

New 23-yard B Tournapull offers 10 gear ratios, allowing selection of working speeds best suited to underfoot conditions. High apron lift permits free ejection of any material.

This giant piece of construction machinery, powered by a 293 hp diesel is big and fast. It offers 10 gear ratios, ranging from 2.4 to 28.4 mph. This, the manufacturer points out, allows selection of working speeds best suited to underfoot conditions. Its low gear matches pusher speed and gives full lugging power for pulling through soft going. Its fast shifting ability gets the B into higher hauling speeds quick.

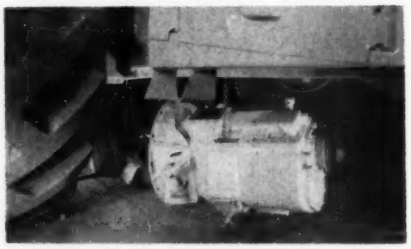
Other features embodied in the new B include the easy loading characteristics of its new scraper design, deflector plate, high apron lift, wheels inside the cutting edge of the scraper blade, power steer steering wheel and full-shift fuel supply.

Interchanbeable with the scraper for use with the B Tournapull is a 35-ton Rear Dump, pictured here dumping its load at crusher.

Additionally, this new machine has been engineered for quick and easy replacement of component assemblies—with emphasis on accessibility. All major assemblies such as transmission, clutch, final drive and differential can be lifted from the machine without the necessity of time-consuming handling of other components, according to LeTourneau-Westinghouse.

One feature of the new machine is that its blade is correctly angled for the most efficient cutting action. The pushblock is newly-designed to connect with the scraper bottom as well as the side sheets. This gives direct action and makes use of the full power of the push tractor. Because the pushblock is low, it directs the push tractor's thrust straight to the blade. The block is rigidly reinforced for maximum strength.

The quick release on the scraper allows gravity drop of the bowl, with the machine's electric controls always available for hoisting. This feature, it is pointed out, allows the operator to "pump" loads, recognized as a big help in working effectively in sand and other loose materials. "Pumping" also keeps material boiling for big loads.



The new B is engineered for quick and easy replacement of component assemblies. For instance, the transmission can be dropped in an hour without pulling the engine.

Disassembly is easy on the new B. The transmission can be dropped in an hour without pulling the engine. The transfer case can be taken off in a few minutes by removing only a few bolts. Bolt sizes are held to a minimum. Drain and fill plugs can be reached easily, and the number of lubrication points and type of lubricants are reduced to the lowest practical limits. Side runners are replaceable.

Interchangeable with the scraper for use with the B Tournapull is a 35-ton Rear Dump. Carrying 35 tons, it is rated at 23 yards struck and 27 yards on a 2-to-1 heap without sideboards.

Dimensions of this big, wide bowl are 17′ 8″ long, 19′ 2″ wide with a maximum depth of 7′ 6″ deep. The rear of its body provides wide, low entry of the dipper which gives extra speed advantage for the excavator. Its wide body reduces spillage.

The giant body raises to vertical position at the touch of a dashboard switch. It is so designed that no material rides back to shovel or dragline. The edge of the bowl swings behind and below the rear wheels so that rocks cannot roll forward to lodge against the wheels. This also prevents material from piling up under the rear end.

This rear dump, the manufacturer points out, is made of heavy steel plate, rigidly reinforced with box beam ribs.

● Appointment of M. B. (Jack) Crowley as eastern regional sales manager of the Austin Division, Central Ohio Steel Products Company, Galion, Ohio, is announced by O. C. Henkel, president.

M. B. (Jack) Crowley, new eastern regional sales manager of the Austin Division, Central Ohio Steel Products Company.

A mining engineering graduate of the New Mexico School of Mines, Mr. Crowley was formerly associated with the Caterpiller Tractor Co., where he served as a special representative in the Mining Section of Caterpillar's Sales Development Division. His experience also includes service in Latin America as a sales representative for the American Hoist and Derrick Co., St. Paul, Minnesota.

In his new assignment, Mr. Crowley will be responsible for sales development of Austin Overshot Loaders in the states east of the Mississippi River. His headquarters will be in Galion, Ohio.

Coal Is A Mineral Storehouse

(Continued from Page 6)

a particular area is deficient in certain of these minor elements. Because coal ashes may contain the elements needed by the soil and the plants, they can be directly applied as fertilizer.

It has been reported that in some areas of the Southwest, coal ashes are already being used for their value as a fertilizer.

Coal is a form of mummified wood that has lain buried for millions of years. Plants then, as they do now, took in trace elements or minerals into their systems.

At first, the plants formed a peat-like swamp and it was during this time that the biochemical processes in the first step of coal formation took place. These biochemical processes were followed by a lignification process. Finally, the heat of friction and pressure exerted for a long time produced the coal as we know it today.

Scientists are now trying to determine whether these minor elements were inherent in the plant ash or introduced by sediments brought in from the surrounding land features. Or further, whether the plants were growing over concentrations of the minerals as they do today, and that this might lead to findings of mineralization near or under coal.

Historically, the study of minor elements in coal got off to a comparatively late start. Pioneer work was done during the 1930's by Victor Goldschmidt and C. L. Peters, who first called attention to the unusual concentrations of germanium and other rare metals in some European coals.

Work in the United States got its boost during World War II, mostly when refinements were being made in spectrographic techniques and other aspects of geochemistry. But it was not until the Geological Survey set up its program of systematic study that the importance of the minor elements being discarded as waste became strikingly evident.

The work in this country has been carried on largely by the Survey, the U. S. Bureau of Mines, the West Virginia Geological Survey and the Eagle-Picher Company.

Russia is thought to be very much interested in the study of the minor elements in coal and has been involved in this work from the earliest. The same is true of England. Scientists in Australia, Czechoslovakia, India, Argentina, New Zealand and Spain have also contributed to the knowledge of this field.

It was recently reported that Germany, Japan and England are now operating plants for the recovery of germanium from fly-ash and the residual ash of coal.

Lloyd G. Fitzgerald, explosives engineer (left) and M. J. Havonec, coal mine instructor (right) are shown conducting U. S. Bureau of Mines Accident Prevention Class at Bishop Mine, Pocahontas Fuel Company, Inc., at Bishop, W. Va., where 784 men or 100 per cent of men at the mine completed the 10 weeks course. Fitzgerald demonstrates how gas ignitions occur in coal mines.

● Appointment of Floyd Baker as western regional sales manager of the Austin Division. Central Ohio Steel Products Company, Galion, Ohio, is announced by O. C. Henkel, president.

Before joining the Austin Division as a sales engineer 18 months ago, Mr. Baker was an independent contractor specializing in dam, highway and large building construction.

Floyd Baker, new western regional sales manager of the Austin Division, Central Ohio Steel Products Company.

In his new assignment, Mr. Baker is responsible for sales of Austin Overshot Loaders in the states west of the Mississippi River. His headquarters will be located at 2 Santa Fe Drive, Denver, Colorado.

● Establishment of a consolidated sales and service department, effective January 1, for the entire line of Marion - Osgood - General equipment in both the domestic and export markets was announced by Marion Power Shovel Company.

D. E. RIZON

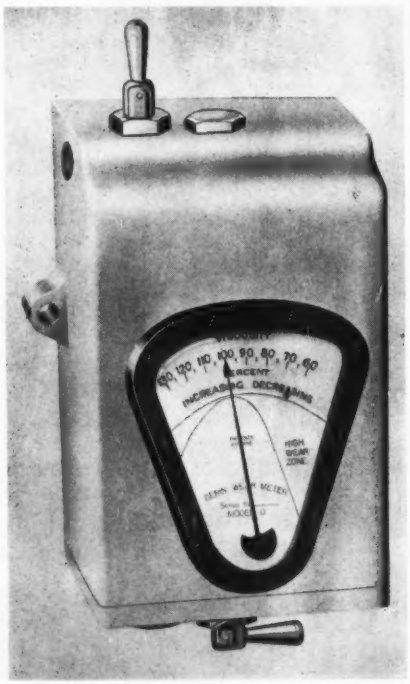
D. E. Rizor has been named to head the coordinated program as vice president for sales and service. A member of the Marion Power Shovel Co. for the past 29 years, he previously was vice president in charge of service, parts and pricing.

● A new Engine Wear Meter has been announced by The Gerin Corporation of Avon, N. J.

It is a gauge permanently attached to any engine and claims to warn the operator when there is fuel dilution, water or antifreeze leakage, running on dead filters, wrong grade make-up oil and the like.

The meter responds to any increase or decrease in viscosity. Viscosity is said to be the best and most sensitive indicator for changes in the crankcase oil which the operator must guard against to avoid rapid wear of piston rings, cylinder bores, timing gears and other parts that otherwise do not last as long as the rest of the engine.

The maker says this is not a new idea but unlike previous instruments this meter does not respond to the normal thickening or thinning of the oil incidental to varying operating temperatures. Hot or cold, the indicating hand points only to true and permanent changes.



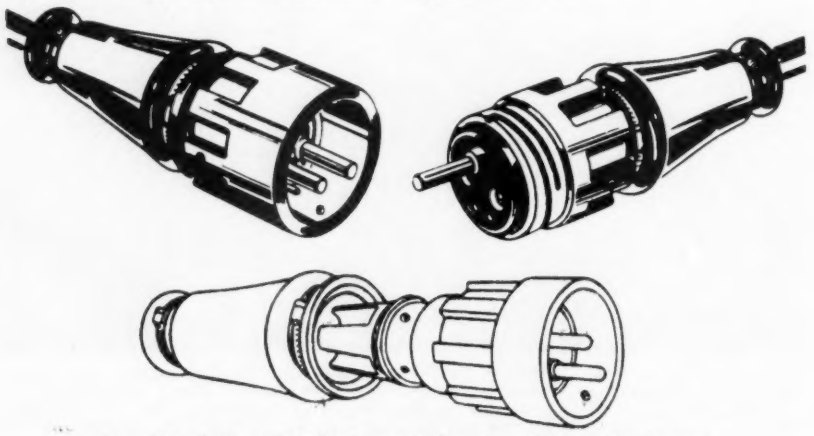
Accuracy within 1% is claimed and therefore the meter does not show the oil up a little on one reading and down the next. It is also remarkably sturdy and the internal movement does not vibrate when the instrument is subjected to vibration and shocks, as on truck and locomotive engines. When the engine is worn out the meter can be transferred to the replacement unit.

Installation takes 30 minutes on any engine.

A sixteen page Booklet 800 titled "Engine Insurance" contains much interesting information on lengthening the life of engines and keeping away from periods of operation during which excessive wear occurs. The booklet is distributed free.

Caterpillar Diesel D6 Tractor equipped with No. 6A Bulldozer is removing overburden on coal near Knoxville, Iowa.

● The Joy Manufacturing Company of Pittsburgh, Pa. reports completion of a new line of attachable electric plugs and receptacles for Mining requirements. Named the "Quik-Loc" series because ¾ turn couples or uncouples them, they are available for AC or DC applications, from 35 to 450 ampere ratings (i. e. No. 8 through 750 MCM, AWG). Factory molded of flame-resistant Neoprene compound and equipped with corrosion-proof couplings or mounting shells, they are watertight, distortion-resistant and shatterproof . . . according to the manufacturer. Plugs consist of two parts . . . the connector head containing contacts and wiring terminals — and a protective Neoprene sleeve that fits over cable/connector juncture. Assemblies are snugly held together by three gear driven ring bands (see illus.). A new 2-color bulletin No. B57, just off press, provides complete details. Those interested may obtain a free copy by writing to JOY in Pittsburgh, care of Department J-2.



Joy Attachable Electric Receptacles for Mining Equipment.

● Catalog 877 describing the 76-AM COLMOL for continuous mining in low vein coal is announced by the Mining Sales Division, The Jeffrey Mfg. Co., Columbus 16, Ohio.

This 12-page catalog includes installation photos, details of construction and operation, a dimension drawing and general specifications. The 76-AM COLMOL is a high-capacity boring type machine for coal seams 38 inches and upward.

● A new five-roller, oscillating-type roller frame is now available as an attachment for the Caterpillar D4 Tractor, according to an announcement from Caterpillar Tractor Co., Peoria, Ill.

Installation of this track roller frame on the D4 will provide increased traction, greater flotation and better stability, particularly when the unit is operating in hilly terrain and locations where soil conditions are soft or unstable.

A new five-roller, oscillating-type track roller frame is now available as an attachment for the Caterpillar D4 Tractor.

A tractor equipped with a five-roller track frame require a 34 section track in place of the 31 section track included on the standard four-roller machine. If large idlers are used, a 35 section track can be installed. Light-type roller guards are available as attachments for use with the five-roller track frame.

Also available for use with the five-roller track frame are the new tool bar and tool bar bulldozer arrangements. The draft members of this tool bar are longer to permit a single position for the trunnion plates, making possible rapid changeover from front to rear operation by simply swinging the draft members to the desired position.

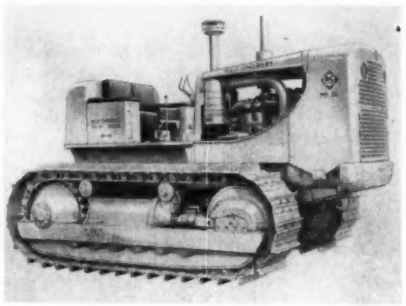
Caterpillar Diesel D8 Tractor equipped with No. 8S Bulldozer is removing overburden from new vein of coal at Palmer Coking & Coal Co., Black Diamond, Wash.

Grafton Coal Company strips a variety of materials in the Clarksburg, West Virginia area, uncovering coal veins in their mining operation. Overburden stripped ranges from loose gravel to large rock. Grafton is using a Manitowoc Model 4500 Dragline equipped with 120 ft. boom. The machine shown is one of two Manitowocs being used by the coal strippers who are working two shifts a day in this project.

● The biggest and most powerful crawler tractor ever put into production is coming off assembly lines at the Springfield plant of Allis-Chalmers Mfg. Company. Dealers throughout the country are now unveiling the new giant which promises to make crawler tractor history.

The new HD-21 is designed to meet the changing demands of jobs that require a tractor with more power, longer life and the ability to operate at a lower cost per unit of work. The tractor weighs 44,000 lbs., develops 204 hp. at the flywheel and will offer the popular, high-output torque converter drive as standard equipment. Among its many new design features are a new high-capacity cooling system, a new master clutch, new transmission, new Tru-Dimension track, new Wrap-Around radiator guard and the new Allis-Chalmers diesel engine.

The HD-21's new power plant benefits from the latest developments in combustion chamber design, applying them for the first time in the crawler tractor industry to produce a new kind of "follow-through" combustion. The key explosion in the new engine occurs in a dual-chamber energy cell with the crankshaft well past top dead



center, unleashing a spearhead of flame which produces a new standard of controlled combustion. This results in higher sustained working pressures at the most favorable crankshaft angles. Benefits to users are greater work capacity; smooth operation; effective lubrication; clean, complete combustion; low loading of engine parts and extra long over-all engine life.

One of the most significant developments in the HD-21 is the high-output performance of the torque converter—engine—transmission team. This new combination provides extra speed with any load, extra pulling power at any speed, plus wider speed ranges and more range overlap. With its advanced design torque converter, which is the result of fifteen years of Allis-Chalmers experience in this field, the HD-21 is said to work with less shifting than ever before possible.

The power train for this tractor is designed to provide the extra strength and durability needed to handle the bigger loads of today's construction jobs.

● Detroit Diesel Engine Division of General Motors has announced the availability of a new engine water filter as an optional accessory on Series "51", "71" and 6-110 Diesel engines.

Through the use of mechanical filtration, inhibitors and resistor plates the filter removes impurities from the cooling system, softens the cooling water and controls alkaninity, rust formation and electro-chemical action.

The unit contains a replaceable filter element which is to be renewed at regular intervals depending upon the chemical composition of the cooling water. In the event the element becomes clogged, water by-passes the filter and no filtering action takes place until the element is replaced.

The filters are easily installed and range from 3⅛" to 5" in diameter and from 6" to 7½" in height.

● The Carmet Division of Allegheny Ludlum Steel Corporation has available a new methods manual and catalog on cemented carbide mining tools. It offers a complete line of cutting and drilling bits for the coal industry. In addition to various types of cutter bits, finger bits, roof bolting drills, and coal drills are also described. Reconditioning equipment and procedures for use on Carmet carbides are also recommended. Copies are available on request from: Advertising Department, Allegheny Ludlum Steel Corporation, 2020 Oliver Building, Pittsburgh 22, Pa.

● How can mine operators cut stripping costs 50%? Is there an engine that will deliver trouble free performance, few adjustments and repairs, low operating costs, long life, and steady power? These and other questions are answered in a new booklet titled MODERN MACHINES FOR MINES, PITS AND QUARRIES published by Caterpillar Tractor Co., Peoria, Ill.

The new eight page booklet contains on-the-job photographs and job descriptions of track-type tractors, shovels, motor graders, wheel tractors, scrapers, side dump trailers, and engines on mining operations throughout the world.

MODERN MACHINES FOR MINES, PITS AND QUARRIES (Form No. E492) is available from Caterpillar distributors or by writing Caterpillar Tractor Co., Peoria, Ill.

SHOVELS

Manitowoc Model 3000 Shovel and Drag 1¾ Yd. ----------$27,500.00

Manitowoc Model 3500 Shovel, 2 Yd. $30,000.00

Bucyrus-Erie Model 38B Shovel, 1½ Yd. ----------$22,500.00

Marion Model 93M Shovel and Drag 2½ Yd. ----------$30,000.00

Northwest Model 6 Shovel, 1½ Yd. **$21,500.00**

ANDERSON EQUIPMENT CO.
Box No. 1737, Pittsburgh 30, Penna.
Phone LEhigh 1-6020

DRAGLINES

Manitowoc Model 4500, 120′ Boom, 5½ Bucket, New 1951 ----------$100,000.00

Manitowoc Model 3500, 80′ Boom, 2½ Yd. Bucket ----------$35,000.00

Lima Model 1201, 80′ Boom, 3½ Yd. Bucket, New 1950 ----------$32,500.00

Marion Model 93M Drag and Shovel, 2½ Yd. ----------$30,000.00

Manitowoc Model 3000 Drag and Shovel ----------$27,500.00

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Jeffrey 30 x 30 Angle Roll Crusher Mine Hoist complete with 115 HP GE 440 V motor and Controls—Rope Speed 450′.
Jeffrey MH 110 Loco 12 ton 250 V price **$1050.**
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40 KVA GE Transformers, type H Form K 2200/4000 Pri. 220/440 volt sec.
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Falk Hoist 7′ **Drum** less motor.
Manitowoc 4500 Dragline.
Lima 1201 Dragline 85′ boom, 3 yd. Cummins Diesel.
D-8 Bulldozer, Bargain Price.
McCarthy Hy wall Auger 36" gas motor.
Herdsogg Hy wall Auger 30" gas motor.
Marion 7200 can be inspected while working.
Osgood 1006 can be inspected while working.
Joy Shuttle Cars 5-SC, 7-SC Jeffrey 65 to 66.
GE 840 Loco 15 T. Tandem Contactor control.

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Joy 11 RU Cutter on Rubber.
Joy "Cat" Trucks—low type only.
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1—Jeffrey 29C Cutter on cats.
1—Joy Continuous Miner, 3 JMC—34" hi.
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3—14BU med. pedestal Loaders, 10 H. P. Motors, 7 RBE.
2—14BU, 3PE med. pedestal Loaders, 7½ H. P. Motors.
2—12BU, 9E latest type Loader.
3—8BU Loaders, one 33½" high.
4—11BU Joy Loader, rebuilt, hi capacity.
2—Joy T2-5 low pan Cat. Trucks.
1—Joy T2-6 low pan Cat. Trucks.
1—Joy T1 Standard Cat. Truck.
2—Joy 30" Belt Conveyors, 1000' and 2000' centers. Like new.
1—Jeffrey 61 CLR rubber tired Loader, 26" high.
6—Jeffrey 35L Cutting Machines, 250 volts DC. Perfect.
4—Joy 6 SC four wheel drive Shuttle Cars, rebuilt. Elevating discharge, Airplane brakes.
2—Joy 5 SC four wheel drive Shuttle Cars.
6—42E Shuttle Cars, as is or rebuilt.
2—Joy 32D9 Battery Shuttle Cars.
3—Joy PL11-14 Elevating Conveyors, rebuilt.
2—Joy PL11-5E Elevators as is or rebuilt.
2—Joy Belt Feeders, PL-12.
3—Myers Whaley No. 3 Automat Loaders.
Jeffrey L-500 Loaders.
Goodman 360 Loaders.
Cedar Rapids portable Screening Plants.
3 Grades with conveyors. Like new.
General Electric and Westinghouse Rotary Converters and M. G. Sets, 100 to 500 KW, latest types. All voltages. Real bargains.
3—Goodman 512 EJ Cutting Machines.
6—Diesel Plants, G. M. C., International, Cummins, 50 to 125 KW, 250 volts DC.
5—Goodman 312 low vein Cutting Machines, like new.
8—Baby Goodman 212AA Cutting Machines, Jeffrey 35L, 35B, 29C, 29L Cutters.
50—Locomotives of all types in stock from 4 to 20 tons.
5—Gas and Diesel Locomotives, 4 to 25 tons.
1—Differential Slate Larry, 12 ton.
2—8000 Gal. Storage Tanks, like new.
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Vibrators, Car Retarders.
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50 tons Copper Trolley and Feeder Wire. All sizes.
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621 Page Diesel Walker, 135' boom, 6 yd. bucket. Excellent condition.

4500 Manitowoc Combination, 5½ yard shovel, 140' boom, 4 yard dragline, D-386 Caterpillar engine. Excellent condition. Priced right.

4500 Manitowoc Dragline, 140' boom, 5 yard bucket, D-386 Cat. engine. Fine condition.

1201 Lima Dragline, 85' boom, 3 yard bucket, Cummins diesel engine. Very good condition.

Ingersoll Rand Quarrymaster blast hole drill.

58BH Joy Champion Electric 7⅞" blast hole drill.

42T Bucyrus-Erie diesel and electric well drills for 9" holes.

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Item P234 Caterpillar D8 Tractor, mounted with LeTourneau straight cable blade and LeTourneau cable control. Transmission and master clutch reworked. New tracks and new sprockets, machine completely gone over and painted. F.O.B. Pittsburgh, Pa. **price** ...$12,130.00

Item P237 Caterpillar Model D7 Tractor, mounted with LeTourneau cable control and bulldozer. Completely reconditioned. Good appearance and operating condition. Painted and decaled. F.O.B. Pittsburgh, Pa. **Price** $7,100.00

Item P272 Caterpillar R4 cable dozer, "As is, where is" . . . F.O.B. Pittsburgh, Pa.
Price $1,500.00

Item P245 Caterpillar D4T4 cable traxcavator. Machine is in good running condition. F.O.B Pittsburgh, Pa. **Price** $2,900.00

Item P274 Caterpillar D4T4 cable traxcavator with angle grader. F.O.B. Pittsburgh, Pa.
Price $1,800.00

Item P121 Caterpillar Model D17000 engine. Rebuilt and guaranteed. **BONDED BUY** F.O.B. Pittsburgh, Pa. **Price** ...$6,500.00

Item P295 Caterpillar Model No. 112 Motor Grader. Tires 60% good. Equipped with: Standard leaning front wheels and tires; cab; scarifier. Painted and decaled. Appearance good. F.O.B. Pittsburgh, Pa. **Price** ...$8,000.00

Item P299 Caterpillar Model No. 112 Motor Grader—new July, 1954 (used only four months 600 hours). Equipped with: Steering booster; cab and heater; wiper and defroster; lighting system; scarifier; large front wheels and tires. Excellent condition, painted and decaled. Guaranteed 90 days. F.O.B. Pittsburgh, Pa.
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Item E137 TD14 International Tractor, equipped with Bucyrus-Erie hydraulic angling blade. Tractor has just had $2,000.00 in repairs put in it. Is very good condition. F.O.B. Erie, Pa.
Price $5,500.00

Item E141 HG Cletrac with IMP bulldozer. Cleaned and painted. Fair condition. F.O.B. Erie, Pa.
Price $1,000.00

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Advertisers' Index

COAL MINING

MARCH, 1955

Allis-Chalmers—Tractor Division 2
Agency—Bert S. Gittins

Anderson Equip. Co. 18

Beckwith Machinery Company
Insert between Pages 2 and 3 19-20
Agency—Hosler Advertising Agency

Caterpillar Tractor Co. ..... **Insert between 2-3**
Agency—Thompson Adv. Inc.

Euclid Division of
General Motors Coporation ..... **2nd Cover**
Agency—Richard T. Brandt, Inc.

J. T. Fish 19

Foster Company, L. B. 19
Agency—Lando Advertising Agency

Greensburg Machine Company 19

Highway Equipment
Company ..... **1st, 3rd and 4th Cover**
Agency—Palm & Patterson, Inc.

Licking View Tool & Machine Co. 3

Lusk Co., Harold C. 3

Moore-Flesher Hauling Company 3

Ohio Machinery
Co. ..... **Insert between Pages 2 and 3**
Agency—Hosler Advertising, Inc.

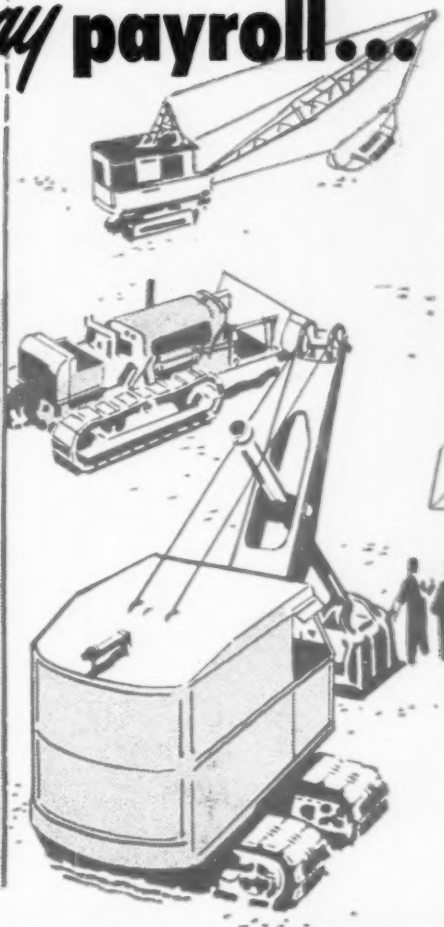
Salem Tool Company, The 1-3
Agency—Meek & Thomas, Inc.

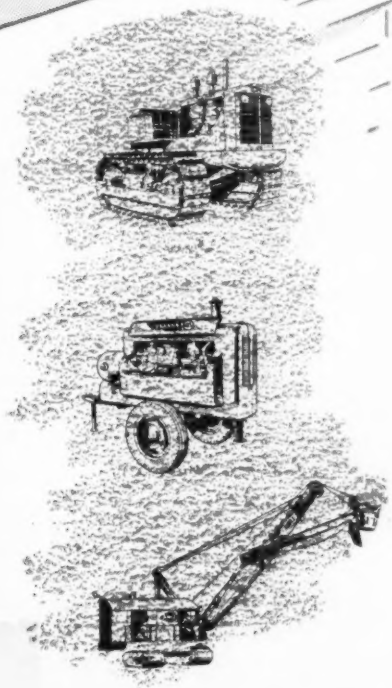
T. L. (Les) Simpson 18

Swabb, Frank, Equip. Co., Inc. 19

Walker Machinery
Co. ..... **Insert between Pages 2 and 3**
Agency—Hosler Advertising, Inc.

this man is on the *Highway* payroll...





but he works for YOU!

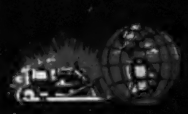
He's the Highway Equipment expert who is always glad to share your production headaches, help you prepare cost estimates . . . make common-sense, practical recommendations that will save you time and money.

Every Highway representative possesses an extensive background of sound equipment experience. Each has been carefully trained in manufacturers' plants and in Highway's own equipment school. Each is eager to serve you at any time.

For a quick, sure, economical solution to your equipment problems—call your nearest Highway representative today.

A-7491

Highway EQUIPMENT COMPANY



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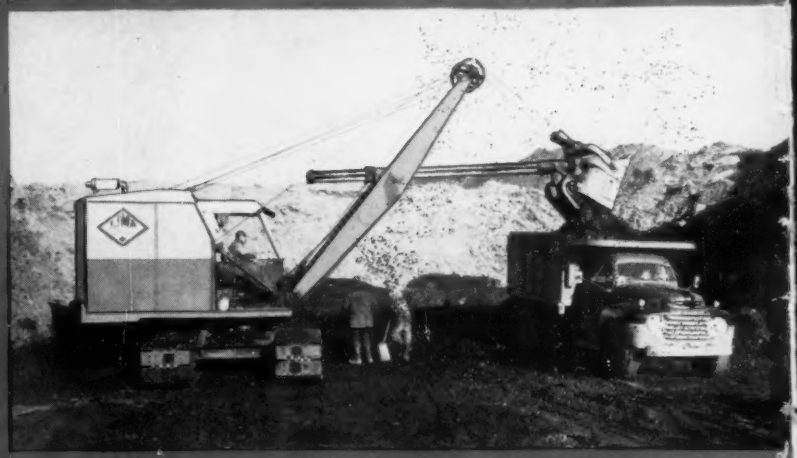

Lima Paymaster . . . *Sunbeam* Coal Co., North Washington

A-9060

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